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COTTON PRODUCTION IN BRITISH EAST AFRICA

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C O N T E N T S

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COTTON PRODUCTION IN BRITISH EAST AFRICA

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By P. K. Norris, Agricultural Commissioner

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For several years the total production of cotton in foreign countries has increased more rapidly than production within the United States. About 30 years ago, foreign countries were growing approximately 30 percent of the world's cotton supply. Today they are growing nearly half. One of the factors responsible for this increase in foreign countries is the development of new areas in the African possessions of several European countries.

France, Belgium, Great Britain, Italy, and Portugal have been actively encouraging cotton growing in their various colonies. The British appear to have made the most progress. In British East Africa, the crop has increased about fivefold since the World War, reaching 393,000 bales in 1936. Cotton has become a factor of considerable economic and social importance in this area. Government agencies have fostered production as a means of increasing State revenues as well as producer incomes.

Practically the entire East African crop is exported, and for several years it has been the most valuable item of export. Because East African cotton is sold in direct competition with cotton grown in the United States, the conditions of production and marketing, as well as the outlook for further development, are of interest to the entire cotton industry of this country.

Area and Population

British East Africa embraces an area about two and one-half times that of the State of Texas. It lies along the eastern coast of Central Africa and extends west to the Belgian Congo. It is bounded on the north by the Anglo-Egyptian Sudan and Ethiopia, and on the south by Northern Rhodesia, Nyasaland, and the Portuguese colony of Mozambique. The three political divisions making up British East Africa differ in their relations to the British Government and administer their territories independently of each other, but they are similar in general administrative policy. See map on page 3.

Tanganyika Territory, forming the southern portion of British East Africa, accounts for about 53 percent of the total area. Prior to the World War, this area was known as German East Africa, but since the war it has been administered by Great Britain under a mandate from the League of Nations. Kenya Colony and Protectorate, lying to the north of Tanganyika, represents about 33 percent of the total area, including

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Based on a report of a field investigation in British East Africa made by the author in 1936-37. Revised from an article under the same title in Foreign Agriculture, Vol. I, No. 7, July 1937.

a strip of land along the coast which is leased from the Sultan of Zanzibar. Uganda Protectorate forms the extreme northwest portion of British East Africa and contains about 14 percent of the total area. While Uganda is the smallest of the three countries, it is the most important with respect to cotton production and is larger than the combined States of North and South Carolina.

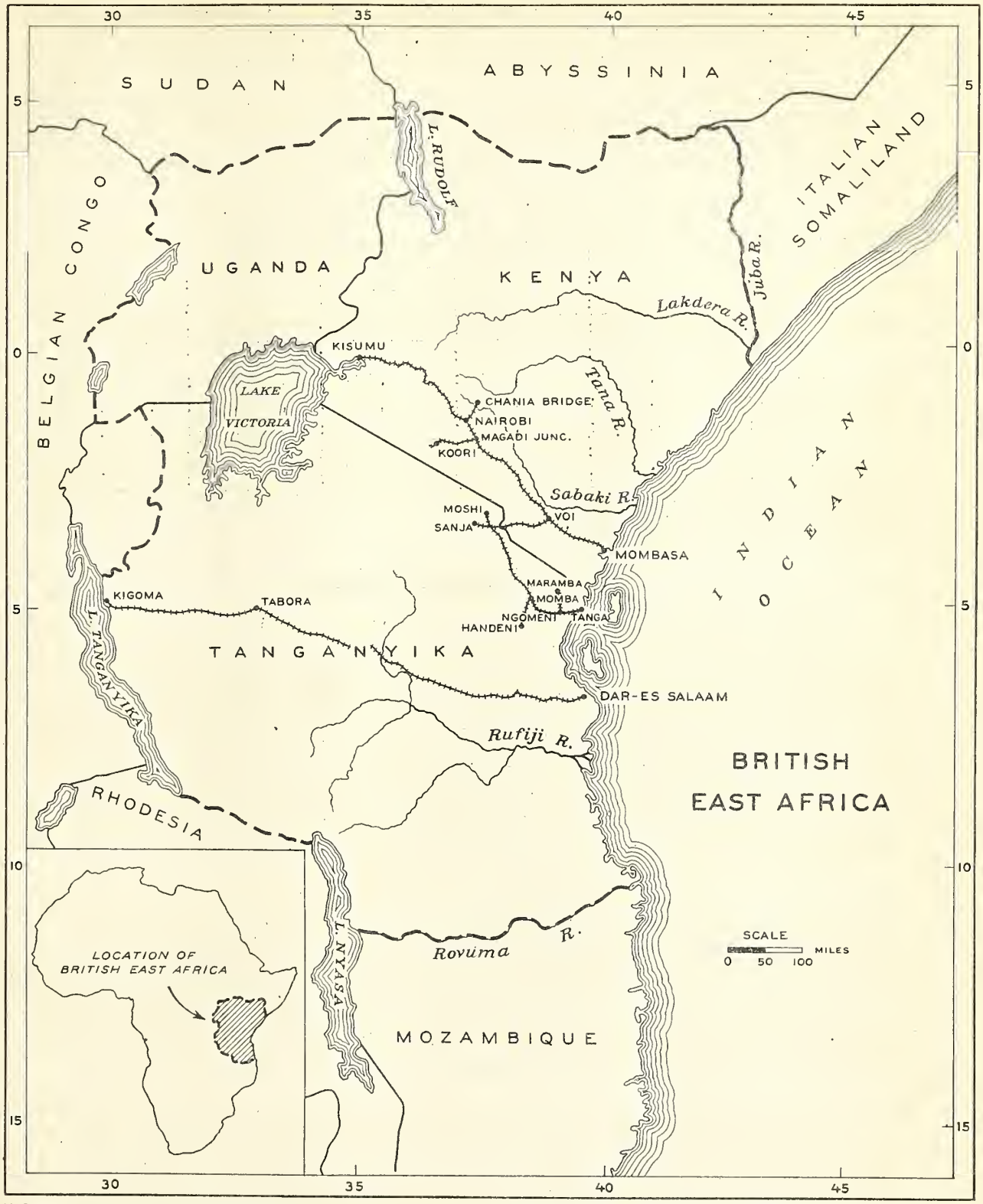
Most of British East Africa is a high plateau, rising from a narrow coastal plain to an elevation of more than 10,000 feet in western Kenya. The elevation of Uganda and Tanganyika ranges from about 3,200 to 4,500 feet, while much of Kenya is more than a mile high. The mountains that dot this plateau are the highest in Africa and, although located on the equator, several of the peaks are snowcapped.

The population of British East Africa is estimated to be in excess of 11,700,000, of which all but about 129,000 are natives. The nonnative population includes Arabs, Swahili, Sudanese, Indians (Asiatic), and Europeans. The population is fairly equally distributed among the three divisions, with that of Tanganyika somewhat the largest. Uganda is the most densely populated.

The natives in the heavily populated areas around Lake Victoria are perhaps the most intelligent tribes in Africa. Along the seacoast of Kenya and Tanganyika, they are somewhat mixed with Arabs and Swahili. The plateau area between the coast and Lake Victoria is sparsely populated by native tribes, some of which have advanced little beyond the semisavage state. These people live largely by hunting or as herdsmen and follow a primitive form of agriculture, producing corn, beans, cassava, sweet potatoes, and other food crops.

The density of the native population varies greatly, depending upon the soil, rainfall, altitude, and health conditions. In Uganda, the average density is estimated at 45 persons to the square mile. The Buganda and Eastern Provinces are the most densely populated. Here the people have developed a relatively high degree of native agriculture and are more settled and industrious than most of the other tribes of East Africa. Along the northern border of Uganda, where the rainfall is light, however, the population is scattered and the inhabitants are more or less nomadic. Most of the natives who follow any gainful occupation are engaged in some form of agriculture.

In Tanganyika, the average population is less than 15 persons to the square mile, but in some districts around Lake Victoria it exceeds 200 to the square mile. Other densely populated areas of Tanganyika are the districts north of Lake Nyasaland and around Mount Kilimanjaro on the Kenya-Tanganyika border. Over large sections of central Tanganyika where the area is free of sleeping sickness, scattered tribesmen graze herds of sheep, goats, and cattle. They practice very little agriculture aside from the production of food crops, but are gradually being induced to take up the growing of a cash crop.



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Kenya, with an average native population of about 13 persons per square mile, also has a heavy concentration in the districts around Lake Victoria. In some of the lake districts, the population exceeds 175 per square mile. More than one-third of the total native population of Kenya lives in the lake region. While many of the people are still primitive in their outlook, within the past few years they have developed a desire for various European manufactured goods. This is a factor of some consequence in connection with the stimulation of cotton production.

BRITISH EAST AFRICA: Area and population, 1936

Territory	Area	Population			
		European	Indian	Native	Total
	Square miles	Number	Number	Number	Number
Kenya	224,960	16,812	57,135	3,024,975	3,098,922
Tanganyika	360,000	8,193	29,640	4,950,505	4,988,338
Uganda	93,981	1,959	15,086	3,623,591	3,640,636
Total	678,941	26,964	101,861	11,599,071	11,727,896

Compiled from the latest official censuses and estimates of the Governments of British East Africa.

History of Cotton Production

Wild cotton was found in the Lake Victoria region by the earliest explorers, and cotton has been cultivated along the coast of what is now Tanganyika and Kenya for more than half a century. Early cultivation was largely by slave labor under the control of Arab plantation owners but was practically abandoned when slavery was abolished. The present cotton industry in British East Africa has developed as a result of activities of the colonial officers and missionaries and the encouragement given by semiofficial European cotton-growing organizations. Some of these organizations are still directly or indirectly engaged in the development of cotton in the newer East African areas.

The economic potentialities of cotton production in the regions around Lake Victoria were recognized as early as 1900. The most serious obstacle, the lack of transportation, was overcome by the building of the railroad in Kenya from Mombasa on the coast to Kisumu on Lake Victoria, and the development of steamboat service on the lake. A further impetus was given the industry by the extension of the railroad from Kisumu to Kampala, and the construction of a line from Dar-es-Salaam, Tanganyika, to the lake districts of that country.

The early cotton seed brought into Uganda was probably of Egyptian or Sudanese origin and is said to have been introduced by Arab traders. Little is known of this cotton other than that it appears to have been ill suited to the soil and climate. Commercial production dates from 1903, when the seed of American Upland, Egyptian, Peruvian, and Sea Island cottons was distributed to the natives of Buganda Province. Of these cottons,

the American Upland strain gave the best yields. In 1905, a ton of American Upland seed was planted, and Egyptian cotton was given a further trial at the same time. The advantage of the American over other types was so apparent that since 1906 only American Upland has been grown. Several shipments of seed from the United States of the varieties known as Black Rattler, Sunflower, and Allen were imported during that early period. In 1907, the Government began to exercise control over the seed supply, and by 1917 the entire Uganda crop was produced from varieties selected and developed within the country. These varieties have the longest staple of any of the East African cottons, ranging from seven-eighths to one and one-eighth inches, although the average is perhaps not longer than an inch.

In 1919, the Uganda Government imposed a tax on all cotton exported. This tax was earmarked for cotton development, but it soon became evident that such a tax could be used to increase substantially the general revenue, a fact which probably accounts for much of the interest in cotton production displayed by the Government.

The first efforts to develop cotton in Tanganyika were made under German direction about 1900 along the coast and in inland areas where transportation was available. The German program proceeded along the line of working plantation labor under European supervision. This system, however, appears to have been unsuccessful and, after the native rebellion of 1906, the bulk of the Tanganyika cotton crop was grown on small native plots. During the World War, cotton cultivation in this country virtually ceased.

Under British administration, cotton growing in Tanganyika was revived, and a Department of Agriculture was established in 1921 with expansion of the cotton area as one of its chief objectives. Railway construction was important in carrying the enterprise to the Lake Victoria region. Tanganyika is the only one of the three East African countries where the growing of cotton is not entirely in the hands of the natives. A few Europeans are growing the crop, using native labor, but this type of farming represents a small part of the total.

The foundation seed stock used in Tanganyika undoubtedly was imported from the United States, although some of the varieties now used were first grown in other sections of Africa. The staple averages about 1 inch in length and commands a premium in Liverpool over American middling. Varieties have been introduced from neighboring territories in recent years, but little improvement has been made in the varieties in common use. Increased progress has been noted recently in research work affecting varieties of cotton. The British administration has concentrated on encouraging production by natives, pointing out to them that European goods are desirable and that additional quantities of such goods may be obtained by growing cotton as a cash crop.

In Kenya, practically no interest was displayed in cotton for many years following the break-up of the old Arab slave system. Before the war, a gin was built at Kisumu, the Lake Victoria terminus of the

Mombasa railroad, primarily to handle Uganda cotton. Several neighboring Kenya districts utilized the gin, but when it was closed in 1920 the cotton acreage in the Kenya lake area declined to practically nothing. Between 1920 and 1930, the Government encouraged the building of gins, but not enough cotton was produced to keep the gins in operation.

In the Kenya coast area, an attempt made in 1923 to interest natives in cotton growing by distributing seed from Uganda met with some degree of success, and the necessary gins were built. By 1931, the Government had become committed to a policy of intensively encouraging cotton production. All areas where cotton had been tried in earlier years, and some new regions in central Kenya, were brought into the program, which resulted in a substantial increase in the number of native growers. The varieties now in use are very similar to those of the other East African territories and doubtless come from the same foundation stock. The present staple length is about 1-1/32 inches. Grade is largely dependent upon the weather but is somewhat below that of Uganda cotton. Recently more attention has been given the problem of breeding an improved variety. Since 1931, production has increased in the coastal and lake areas, but it is still in the experimental stages in the central regions. As in Uganda, the Government regards the cotton export tax as an important source of revenue.

The Present Importance of Cotton

British East Africa is primarily an agricultural country, and the production and marketing of raw agricultural commodities is the basis for the bulk of the trade and commerce. While growing a food supply is the chief concern of the native farmer, a number of cash crops also are grown and exported, the most important being cotton, coffee, sisal hemp, sugar, tea, and tobacco. The 1935 export value of cotton, coffee, and sisal hemp, the three leading crops, exceeded $33,000,000. If the value of the less important exports is added, the total of the export trade amounts to nearly $44,000,000.

For a number of years, cotton has held first place in export value, followed by coffee and sisal hemp. In 1935, cotton accounted for over 38 percent of the total value of all agricultural exports from British East Africa, coffee about 18 percent, and sisal hemp 17 percent. All of the 1935 figures shown in the table on the next page represent increases over exports of other recent years, the increases being accounted for by advances in both price and volume of business.

About 82 percent of the total value of the cotton exports from British East Africa in 1935 originated in Uganda, 16 percent in Tanganyika, and 2 percent in Kenya. While the latter two countries are showing increased interest in cotton, each of them has one or two export crops of greater importance than cotton. In Uganda, the proportion of total exports represented by cotton has been increasing in recent years, reaching 81 percent in 1935. The 1935 movement of cotton from Tanganyika accounted for about 20 percent of the total trade of that division, whereas sisal hemp represented 39 percent. In Kenya, the value of cotton exports was only 3 percent of the 1935 total exports while coffee amounted to 37 percent.

BRITISH EAST AFRICA: Value of agricultural commodities exported in 1935

Commodity	Tanganyika	Uganda	Kenya	Total
	Dollars	Dollars	Dollars	Dollars
Cotton	2,791,783	13,836,392	374,132	17,002,307
Sisal	5,562,185	-	2,073,994	7,636,179
Coffee	2,386,383	1,132,189	4,582,769	8,101,341
Corn	17,549	5	906,654	924,207
Sugar	-	825,250	259,676	1,084,926
Peanuts	1,029,458	80,683	3,563	1,113,705
All other agricultural commodities	2,241,874	1,497,949	4,103,686	7,843,509
Total	14,029,232	17,372,468	12,304,474	43,706,174

Compiled from the official reports of the Governments of British East Africa.

The Expansion of Cotton Production

The official activity in fostering East African cotton production has not been accompanied by comprehensive statistical records of the results obtained. With the exception of information on production in Uganda, there are few, if any, data on area and yields. Figures used to reflect production usually are the records of the movement of cotton on railroads. These data are tabulated without regard to districts or Provinces, thus making it difficult, if not impossible, to examine the trends in many important producing areas. Recently, a growing public interest has emphasized the desirability of more complete statistics.

Acreage

In Uganda, the only division for which complete statistics are available, the trend in cotton acreage has been sharply upward since the crop was first planted in 1903. During the past 15 years, acreage has increased from 345,000 to 1,488,000 acres. With one or two exceptions, each succeeding year has shown an increase. The million-acre mark was reached in 1933-34, a year in which world cotton prices were at a low level. From 1929-30 to 1936-37, acreage increased steadily, even though cotton prices were low during much of this period.

As previously indicated, Government policy has been the dominating influence in the expansion of cotton in Uganda. Since a large part of the revenue comes from the tax on cotton, it is regarded as imperative that acreage be maintained or increased. So important a revenue item is the tax on cotton that any proposed increase in Government budgets is based upon a compensatory increase in the cotton acreage.

The trend in cotton acreage in Tanganyika and Kenya is known to have been very irregular during the past 20 years. Statistics are lacking, but Government officers working in the cotton areas of these two

countries report that fluctuations have been largely the result of the degree to which the Government has stimulated production. In years when the Government felt it was advisable to increase the cash income of the natives, cotton seed was distributed free to the chiefs with instructions that the people plant it. This action was usually based on the natives' need for cash to pay the poll tax. After seasons in which the sale of food crops by natives was sufficient to pay the poll tax, or when work in European coffee and sisal plantations was plentiful, little cotton was planted. The growing of cotton for tax purposes often resulted in an increased crop during years of low prices.

Yields

Yields in Uganda on the whole are rather low and show a slight downward trend. In districts where a high percentage of the land is under cultivation, much of it is badly eroded and the fertility depleted. Insects also are becoming numerous, which reacts unfavorably upon yields. An average yield of 100 pounds of ginned cotton per acre is about normal, but on good land with proper cultivation yields as high as 200 pounds are obtained. The average for the years 1932-33 to 1936-37 is just under 100 pounds. It seems to have been the policy in the past to encourage increases in acreage without much regard to yields. The fact that the early varieties gave fair yields was a matter of luck rather than the result of breeding and selection.

In Tanganyika and Kenya, the common opinion is that over a period of years yields do not average more than 100 pounds of lint per acre. The average yield in those two countries has not been improved by the breeding or developing of a variety more suited to local conditions. Reliance has been placed almost exclusively upon varieties imported from Uganda. As in that country, particularly in the older centers of production, yields are said to be declining as a result of insect pests, disease, and reduced soil fertility. It has been observed, also, that in the more recently developed districts, where the people are still somewhat primitive in their outlook, better yields would be obtained if improved cultural methods were followed.

Production

Since 1922-23, total cotton production in the three countries of East Africa increased from 83,000 bales of 478 pounds each to an estimated 1936-37 crop of 349,000 bales. The latter figure is the highest recorded for the period indicated, while the 1922-23 figure was the lowest. With the exception of 3 or 4 years, each crop harvested showed an increase over that of the preceding year, often by more than 25 percent.

It is reported that in Uganda 2 bales of cotton were produced in 1903. A steady increase in annual output brought the 1936-37 crop up to an estimated 276,000 bales. That figure represented almost 80 percent of the estimated 1936-37 production for all British East Africa. In 1923-24 the crop totaled more than 100,000 bales. During 1926-27 and 1927-28, production showed a decline but recovered in 1928-29 with a crop

of 171,000 bales. Production declined in 1929-30 because of low yields resulting from disease, but by 1931-32 it had again exceeded 171,000 bales. Low yields reduced the crops of 1933-34 and 1934-35, but the following two crops showed an increase. These variations in production were accompanied by a steady increase in acreage.

More than three-fourths of the Uganda crop is produced in the Buganda and Eastern Provinces, the two most heavily populated Provinces, where cotton is firmly established.

UGANDA: Area, yield per acre, and production of lint cotton, 1925-26 to 1936-37

Crop year	Area	Yield per acre	Production a/
	Acres	Pounds	Bales
1925-26	610,325	119	151,346
1926-27	570,189	92	110,233
1927-28	533,004	104	115,888
1928-29	699,107	117	170,759
1929-30	663,157	78	108,052
1930-31	739,690	102	158,092
1931-32	865,259	96	173,494
1932-33	1,071,410	110	246,718
1933-34	1,090,502	105	239,031
1934-35	1,185,599	85	211,918
1935-36	1,365,529	94	268,910
1936-37 b/	1,487,768	89	276,151

Compiled from the records of the Uganda Department of Agriculture, Entebbe, Uganda. a/ In bales of 478 pounds. b/Estimate.

In Tanganyika, the bulk of the cotton production is found in the area around Lake Victoria. Under German administration, production reached some 8,500 bales annually but practically died out during and immediately after the World War. By 1922-23, production had recovered to more than 5,000 bales. Thereafter, production tended to increase, fluctuating sharply in some years. The 1936-37 crop is placed at around 54,500 bales.

Price appears to influence the Tanganyika crop to a greater degree than that of either Kenya or Uganda, probably because the Tanganyika Government, until recently, was not interested in pushing cotton to the same extent as were the Governments of the other two countries. The recent official interest in cotton in Tanganyika is the result almost entirely of the need for more freight for the Government-owned railroads.

In Kenya, also, the bulk of the cotton crop is grown in the vicinity of Lake Victoria. The 1936-37 crop is estimated to be about 18,500 bales. While this is of little importance in the total East African crop, it represents an increase of almost 300 percent since 1930-31. Prior to that year, cotton growing in the colony received little encouragement, but

more recently the crop has been of special concern to the Government. Nyanza Province, bordering on the lake and adjacent to Uganda, is the leading producing region. The crop there increased from 650 bales in 1930-31 to an estimated 13,900 bales for 1936-37.

The increased production in Nyanza and elsewhere in Kenya illustrates an inverse response to prices. When the prices of agricultural commodities began to decline in 1929-30 and 1930-31, a considerable number of natives employed on European farms producing crops other than cotton were released and returned home. Having become accustomed to a cash income, these people were not willing to return to tribal life, and their desire for cash made it easy to persuade them to grow cotton. Many of the natives who started cotton growing during this period expanded their operations each year even though prices declined. New gins were built and production has now reached the point where the revenue from the cotton tax is of sufficient size to be a factor in the Government budget. The future of cotton in Kenya, therefore, is of considerable official concern.

BRITISH EAST AFRICA: Cotton production, a/
1922-23 to 1936-37

Crop year	Kenya	Tanganyika	Uganda	Total
	Bales	Bales	Bales	Bales
1922-23	-	9,568	73,679	83,247
1923-24	-	14,685	107,619	122,304
1924-25	142	18,179	164,049	182,370
1925-26	355	20,319	151,346	172,020
1926-27	218	13,360	110,233	123,811
1927-28	119	27,576	115,888	143,583
1928-29	529	23,251	170,759	194,539
1929-30	84	19,360	108,052	127,496
1930-31	655	9,499	158,092	168,246
1931-32	1,452	15,096	173,494	190,042
1932-33	3,578	25,801	246,718	276,097
1933-34	5,648	32,642	239,031	277,321
1934-35	7,341	48,994	211,918	268,253
1935-36	13,085	53,076	268,910	335,071
1936-37 b/	18,410	54,393	276,151	348,954

Compiled from the official reports of the Governments of British East Africa.
a/ In bales of 478 pounds; the movements of the crop (sometimes called exports) from the area of production, as shown by the railroad records. Since the cotton is often stored in the port for several months after its arrival, this figure need not check with actual exports to oversea points.
b/ Estimates.

Estimates and Forecasts

Only in Uganda does the Government issue a regular statement dealing exclusively with cotton statistics. Various official annual reports

are published in which reference is made to cotton production, exports, and value. Each of the three Governments issues an annual report in which the acreage, yield, production, and value, as well as amounts of cotton ginned within the chief areas are given, but this information is not uniform for all three divisions.

The Department of Agriculture of Uganda issues monthly bulletins known as "Cotton Reports." This release gives the amount of cotton ginned, the export tax collected, and the area planted. Comments on the weather and crop conditions in the various districts also are included. The total area planted is usually given in the October release. Beginning about January, the monthly purchase of cotton by gins is reported, as well as other data regarding the movement of the crop.

Estimates of the acreage planted are based on sample areas. Each village chief in the area sampled is required to report shortly after the close of the planting season the number of plots planted by his people. An agricultural officer then checks the reports of the chiefs, and by measuring a number of sample plots arrives at an average plot area. This is then multiplied by the number of plots in the village. The early estimates of yields are largely the personal guesses of the officials. As the crop is harvested, the yield is checked and the estimates revised and corrected.

The cotton purchased by ginners is reported in pounds of seed cotton. The Government uses a gin turn-out of 30 percent in converting seed cotton to lint. At the end of the season, it is always found that the number of bales thus obtained is less than the number exported as shown by the railroad bills of lading. This discrepancy exists because the factor used in converting seed cotton to lint is too low and because the ginners do not buy all of the cotton they gin. All cotton, however, is finally accounted for in the records of shipments by rail. These figures, therefore, are used in Uganda as the final statistics of production.

In Tanganyika, the only data on the final crop outturn are the statistics on exports published at the end of each year. In Kenya, also, the export figures are so used, although the production in scattered areas may be referred to in the annual reports of the Department of Agriculture. In neither country is an attempt made to issue acreage or production forecasts for public use. An estimate of production is made prior to the actual harvest, but the figures are not published, and are intended primarily for the guidance of the railway traffic officials. A close check, however, is kept on the movement of the crop into trade channels, and reports on the movement are sometimes released. Cotton ginners make estimates of production in their areas, but the estimates are private or are available only to Government officers.

Area Available for Cotton

There is no apparent shortage of cultivable land in British East Africa. It must not be inferred, however, that the whole territory is suitable for agriculture or could be made to produce cotton. Much of it is in swamps, mountains, and waste lands, while large sections are given

over to game preserves. Such tropical diseases as sleeping sickness and malaria render other sections unfit for human habitation. Large areas in Kenya and Tanganyika, and to a lesser extent in Uganda, while suitable for other crops, are entirely unfit for cotton. Such expansion of the cotton acreage as has occurred, however, does not appear to have encroached upon the acreage necessary for native food production or for grazing. There is still an abundant supply of unused land suitable for cotton production.

Although located on the equator, much of Kenya and Tanganyika is too cool for cotton growing because of the high elevation. Experiments show that at elevations above 4,500 feed in Kenya and Uganda and 3,500 feet in Tanganyika cotton is not a profitable crop. It is estimated that almost half of East Africa has an elevation higher than 4,500 feet. Much of Tanganyika and Kenya lies more than a mile above sea level, and some sections are from 8,000 to 14,000 feet high. A large part of Uganda is below 3,500 feet in elevation, but in the extreme southwest and along the Kenya border it is too high for cotton. Most of the other sections of Uganda range from 3,500 to 4,500 feet above sea level.

Soils

Throughout East Africa the soils of the lower elevations on the whole are fertile enough to produce cotton. The coast soils as a class are sandy, but along the rivers and creeks black, alluvial clay soils are common. At several places along the coast, "black cotton soils" are found in small deltas. In the hill districts a short distance from the coast, the common soils are red sandy loams. Beyond these sandy ridges is a plateau, much of which is low enough and the soil fertile enough for cotton growing, but the light rainfall renders this impracticable without irrigation.

The most common soils of the cotton regions are the loams found around Lake Victoria. These soils vary from a red to a dark chocolate color. The low areas and creek bottoms are a dark sandy to clay loam, while the hills and uplands are a red to a light red sandy loam, which erodes badly when cultivated. They contain little organic matter, but as a rule have a high content of lime, potash, and phosphate.

Erosion is most common in a belt about 50 miles wide around the lake, known as the "elephant grass district." It is an area of heavy rainfall and rank vegetation. Beyond the elephant grass district is a quite different region referred to as the "short grass district." The soils of the short grass area, while much the same as those around the lake, have a higher clay content and on the whole are darker in color. They are not so deep, but as a rule do not erode so badly as the elephant grass soils. Some of the best cotton of the country is grown on this type of soil. To the north of the short grass belt, but of less importance because of the decreasing rainfall, are a number of dark-colored, sandy loam soils. Although these soils are sometimes referred to as black cotton soils, they produce very little cotton and are largely uncultivated.

Over much of the well-established cotton-growing area, soil erosion is a serious problem. The soil texture and the topography are such that the tropical rains and the native system of cultivation have resulted in the abandonment of a considerable area. Cotton growing has accelerated this waste.

Prior to the development of cotton, it was the common practice to clear new land each year for food and to allow the old patch to revert to wild vegetation. With the introduction of cotton, the native farmers largely discontinued this practice and began growing cotton on the same field year after year. The reason for this is not a scarcity of land but rather the labor habits of the natives. To clear and plant even a small area, in addition to that which is required for food, involves more labor than the average native is willing to perform. The result of repeated cotton plantings is a considerable increase in abandoned areas because of erosion.

Rainfall and the Growing Season

The volume of rainfall and its distribution is an outstanding factor in East African agriculture, particularly for cotton. Rains may occur at any time, but as a general rule the wet season, or season of "long rains", comes in the first half of the year. The second half of the year brings the dry season, or season of "short rains." The seasons, however, are not always clearly defined.

The coastal cotton belt has a wide range of climatic conditions. Normally, rains start along the Tanganyika coast in December or early January. Along the Kenya coast, light rains start about March, followed by heavy rains a month later. The rains gradually decrease from June until the end of October, when the dry season sets in. The average rainfall along the Tanganyika coast is above 45 inches annually and decreases to about 35 inches along the northern Kenya coast. As a rule, May is the month of heaviest rainfall, frequently accounting for as much as one-third of the annual total. December and January are usually months of little or no rain along the coast of Tanganyika, while January and February are the months of light rainfall on the Kenya coast.

In the lake districts, the rainfall increases from south to north of the lake. The area, located to the south and east of Lake Victoria, has an annual rainfall of about 40 inches, while to the east and north, in Kenya and Uganda, the rainfall is more than 50 inches. Outside the lake area, however, the rainfall decreases from south to north.

In Uganda, the cotton-growing regions have an average annual rainfall of from 35 to 50 inches, which is roughly divided into two seasons. The season of heavy rains extends from late February to about the first of June, while the dry season starts in August and extends into November. As a rule, December - January and June - July are dry periods. Around the lake the two seasons are not very well defined, the dry periods being scarcely noticeable.

The mean monthly temperatures of Uganda range between 70° and 72°, varying little from season to season. The daily range, however, is rather noticeable. While the monthly means from January to July may not vary more than 4°, the daily changes along the northern border of the cotton belt are much greater. These changes are important in fixing the northern or "upper" boundary of the cotton-growing area. In the regions where the elevation is too high for cotton, the temperature is not always low enough to kill the plant outright, but the period required for maturity is lengthened. It so happens that this prolonged growing season does not fit into the rainfall distribution, a fact which contributes to a very low yield or no yield at all.

The lake district of Tanganyika has a fair rainfall distribution. As a rule, rains start in October and November and continue through May. April and May are months of heavy rainfall, while "short rains" fall during July and August. This distribution fits well into the cotton growing and harvesting seasons. The crop is planted from December to February, during a period of high temperatures, and harvested during the drier period of July to September. Throughout the growing season, the monthly rainfall as a rule is ample and well distributed.

The Kenya lake district likewise has a fair rainfall distribution during the growing season. The crop is planted during July and August. Usually it is completely harvested by February, but late plantings may remain in the fields until March. In the area immediately adjoining Lake Victoria, the rainfall may average 50 inches annually, but a few miles inland it is considerably less, and some of the northern districts often are short of moisture. This fact, together with the high elevations to the north and east, limits the cotton-growing area of the Nyanza Province to a small area around the lake.

Insects and Diseases

Though cotton is a comparatively new crop in East Africa, a number of the most serious insect pests and diseases have become common in all three countries. The most widespread insects are jassids (Empoasca facialis), cotton stainers (Dysdercus spp. oxycaremus), white ants, grasshoppers, stem girdlers, leafhoppers, blossom beetles, "lygus" (Lygus vosseleri), aphids (Aphis gossypii), pink bollworms (Platyedra gossypiella), and common bollworms (Chloridea obsoleta). Black arm (caused by Bacterium malvacearum) is the most destructive disease at present, although others, some of which have not been identified, are known.

Insects and diseases are important factors in the growth of cotton in the higher altitudes. Cool temperatures prolong the growing season but do not prevent the insects from multiplying. It is not uncommon for cotton growing at the higher altitudes to require as long as 10 to 13 months in which to mature. Because of the length of this period, the cotton stainer, the bollworm, the pink bollworm, and other insects become so numerous that it is almost impossible to harvest a crop. Equally difficult conditions prevail along the coast, where rain may interfere with

harvesting. Unless the crop is planted soon after the first of the "long rains", it cannot be harvested before the "short rains" start. Under such conditions, the heavy growth of plants and weeds and the increase of insects greatly reduce the yields, as well as damage the quality of the lint.

With the possible exception of the lake district of Tanganyika, the pink bollworm has spread over the entire cotton area of East Africa. A special effort is being made to keep the lake district free from infection. The area of central Tanganyika, which does not produce cotton, has helped to prevent the pest from reaching the lake region, but the continued success of this natural barrier is in doubt. Most of the cotton insects and diseases have become widespread only in recent years, and new insects are being discovered from time to time. Virtually the only control method now practiced is clearing the fields after harvest. As a rule, however, the native farmers are not interested in the extra work involved.

There are no estimates available as to the amount of damage done by pests and insects. Their control is one of the major problems confronting the various Governments of East Africa. Under present conditions, however, it may be anticipated that losses will increase if the cotton acreage is expanded or cultivation is intensified.

Farm Organization

Until the white man taught him to grow a cash crop, the East African native produced only food crops, and the cultivation of the latter is still his chief agricultural enterprise. Even in areas where cotton is well established, most of the land under cultivation is planted to plantain, sweet potatoes, peanuts, corn, millet, cowpeas, beans, and other food crops.

The agricultural habits of the various tribes differ, but the people in the cotton-growing areas tend to follow a common type of cultivation. This is because of the general supervision of cotton growing given by the Governments and the similarity of the soil and climatic conditions. Cotton is grown almost entirely by natives without white supervision other than that given by the Government agricultural officers. The crop is produced on land owned by the grower or held by the village in common or owned by a local chief. Europeans and Indians, with few exceptions, are not engaged in cotton production either as growers or as landlords.

The average farm consists of a number of small plots scattered about within a radius of a mile of the native village. On these patches, few of which are larger than an acre and the total of which may not exceed 4 or 5 acres, the native family grows food and cotton. The task of clearing away the bush, planting, cultivating, and harvesting is largely performed with hand tools. Very few native cotton growers use any form of animal power, although in some areas of Uganda oxen are used for breaking the land. The planting and cultivating is done with a hand hoe. The growing of food is largely the task of the women, while both men and women cultivate the cotton patches. Though the tribes of the cotton areas no

longer follow a nomadic life, there is still a strong tendency on the part of men to spend their time hunting or fishing and to leave the cultivation of the land to the women.

In preparing new cotton land, the vegetation usually is burned off, and the seed is planted in rows 3 to 5 feet apart. As a rule, plants are thinned to one or two in a hill about a foot to 2 feet apart, depending on the soil fertility. Sometimes cotton is planted for 2 or 3 years in succession on the same land, after which the land is allowed to revert to wild vegetation. The land near the hut or the village is often kept under cultivation longer than that in outlying areas. If the land around the village becomes exhausted, the whole village may move to a new location. After a few years, the once-used lands recover and the village may return to its former site.

While the Government has followed a policy of encouraging the use of plows for breaking the cotton land, it is doubtful if the practice is in fact an improvement over the native system. In villages where plowing is common, it is largely a community enterprise. Several men may own a plow or it may be owned by an individual who plows for the entire village. The plows are drawn by oxen, four to eight being required. Cattle are looked upon as wealth, and every farmer does not own enough oxen for a plow team. If a plowman is hired, the individual farmer is often required to pay more than the work justifies.

It appears, also, that plowing has resulted in increased erosion. The land is so rolling that under the best of conditions erosion is a problem. When the land is cleared and the soil plowed, it is almost sure to wash away in a short time. The practice of clearing a strip that includes in the same field a part of the rich creek bottom land and a part of the adjoining hillside and of plowing of the land up and down the hill rather than in contour is common. When such patches are plowed by an ox plow, the soil is often washed away to the depth of the annual plowing.

The usual method of cultivation is to scrape the weeds and grass off the surface with a short hand hoe, stirring the soil as little as possible. The land is then left rough, and the dead grass and weeds are allowed to remain on the surface. In some areas this residue is arranged in rows across the slope of the hill, forming a crude terrace.

A few acres of food crops and an acre of cotton will require the entire time of an average family. Cotton, like the other crops, may be raised on several small patches in different directions from the village. One or more members of a family may own cotton patches, but the food crops are the common property of the family. The amount of time the average native spends in field labor aside from the time required to produce food is largely measured by the desire for the commodities to be obtained from the local trader. Working as he does with a hand hoe and having to grow food crops as well, the native can cultivate only a limited area of cotton. The past expansion of cotton acreage is principally the result of an increase in the number of patches planted rather than an increase in the size of the patch. Some increase in the size of the patch may occur; but,

until the hand hoe is supplanted by some form of power cultivation or the native is induced to spend a larger part of his time in the fields, this is unlikely.

Cost of Production

Production cost items familiar to the American producer have little meaning for the cotton grower of East Africa. Rent, if paid at all, is based on tribal custom and has little direct connection with cotton. Labor and land that would otherwise be unemployed are used in cotton cultivation. No commercial fertilizer or irrigation is required, and there is almost no capital invested. The seed is furnished by the Government. Ginning, handling, and export taxes are paid by the buyer of the seed cotton, and the native has no knowledge of these costs.

The amount of the hut or poll tax is an important item to the native. This tax is not directly connected with cotton, but it is often based on the cash income of the village. In areas where cotton is widely grown and where the average cash income per native is fairly high, this personal tax is higher than in areas where little or no cotton is grown.

Practically no hired labor is used in growing cotton. The only equipment required is a hand hoe worth about 25 cents. If the land is rented, it may cost about $2.50 per acre per family for both food and cotton areas. Local chiefs may, however, receive a tribute in addition to this.

The marketing charges are largely under Government control. The cost of ginning and inland transportation, the export tax, and the profit to dealers vary according to what the Government thinks the industry should pay. The power to fix a minimum price permits control of these items. For example, an increase in the Liverpool price of cotton might result in an increase in the export tax or the freight rate on the Government-owned railroads, but such increases would be considered in fixing the price paid to native growers. The cost of handling cotton from the time it leaves the native grower until it is landed in a foreign port may amount to as much as 400 Liverpool points (3 cents per pound). It is the general opinion of the authorities that the industry can expand on a Liverpool price of 12 cents per pound and can hold its own at a price somewhat below this figure.

There is little competition between cash and food crops. The Governments insist that each chief require his people to plant food crops and that each family store a part of the crop in a community granary to be used during years of famine or short crops.

The need for credit or financial aid to the cotton grower of East Africa has never arisen. The average grower produces his crops of food and cotton without a cash outlay. As the economic wants of the growers increase, a system of selling on credit or advancing cash may come into general use, but at present it is of minor importance. The handling of the crop after it leaves the hands of the native grower requires a cash

outlay, but this is of no direct interest to the grower. The marketing of the crop is financed by regular commercial banks located in the larger inland towns and at export points.

Marketing and Ginning

Marketing of cotton in East Africa, like production, is Government controlled and closely supervised. The common method grew out of practices developed in Uganda. Tanganyika and Kenya have taken the Uganda system as a pattern and adjusted it to local conditions. The supervision exercised by all three Governments is now fundamentally the same. A description of the Uganda markets, therefore, will apply to the entire area.

From the standpoint of the native, marketing cotton is a simple matter. The crop is picked and transported to the nearest buying center in small quantities, usually on the head of the grower. At the market place the cotton is examined and the grower is paid in cash. All cotton throughout East Africa is sold in the seed. The gin is the primary market, but as a matter of convenience the ginners may have a number of buying stations located throughout the cotton belt. A station usually consists of a small warehouse where the seed cotton is stored until transported to the gin. In the early stages of the industry there were a number of middlemen or commission merchants who purchased cotton from the natives and resold it to larger merchants or ginners. Under this system, price spreads developed which were regarded as so unfavorable to the growers as to cause Government action to bring about a more direct contact between ginners and growers. The marketing regulations have been changed from time to time and now give the Governments complete control of every phase of the industry.

Under existing regulations, the construction and operation of cotton gins and the purchase and transportation of seed cotton are allowed only by license obtained from the Governments. Everyone who deals in any way with cotton from the time it leaves the grower until it is exported from the country is required to have a license and therefore comes under official supervision.

About 1929, a special Government committee investigated the cotton industry of Uganda and recommended that the number of gins and buyers be materially reduced. It was claimed that the portion of the crop handled by each gin was so small and the overhead cost of operation so high that gins could not pay growers the full value of the cotton and at the same time make a profit. It was also suggested that, if unrestricted competition were allowed to continue, a number of ginners would be forced into bankruptcy and that shortly the grower would be at the mercy of the few who were able to survive.

Each gin is now given a fixed percentage quota of cotton for the season. If more cotton than the quota is ginned, a penalty is assessed; if less than the quota, a bonus is paid. For example, if a ginner is allotted 10 percent of the crop of a district but gins 12 percent, a tax is paid on 2 percent. Some ginner in the district will therefore gin less

than the allotted quota, and the assessment paid by the ginner who exceeds the quota will go to the one who does not receive the full quota of cotton. This, in the opinion of the Government, tends to compensate for overhead cost and to enable the ginner who handles but a small part of the crop to pay the grower the full price for his cotton and at the same time make a profit.

Under this system, the Government has created a monopoly for those who are now engaged in cotton buying and ginning. Competition between the ginners within the districts has been eliminated by the system of quotas, and the transportation of seed cotton from one district to another is prohibited. In consideration of this control, however, the price at which ginners may purchase cotton is fixed. The dates on which the purchase of cotton may start at the beginning of the season and on which the various grades may be purchased also are specified. Natives are not allowed to offer for sale dirty, stained, or low-grade cotton until it is definitely known that all clean cotton has been harvested.

The official price is based on the Liverpool price of American Middling 4 months ahead, plus an estimated premium for Uganda staple, minus profits and costs of ginning, transportation, tax, and other items connected with cotton from the time it leaves the hands of the grower until it is delivered at the overseas market. These items are what the Government and the gin associations think are fair to both grower and ginner. The Government appears to favor a liberal profit to the ginner. The price is computed by a Government officer who notifies each of the cotton ginning companies of the price they may pay for cotton on a fixed day. This price is usually fixed weekly but may be changed if the market fluctuations justify it. 1/

Estimates are not available regarding the consumption of cotton in the homes of the natives. While some tribes spin cloth from the cotton they grow, most of the cotton materials used are imported by Indian traders. As soon as the people of a new district take up the growing of cotton, these traders, with a supply of European or Japanese manufactured goods, open trading posts in the district. There are no cotton manufacturing mills in East Africa, and it is doubtful if the Governments would look with favor upon the development of a local textile industry.

Cottonseed products are of little importance. Some efforts are being made to develop a cottonseed processing industry, but little headway

1/ The following formula is used in calculating the minimum price at which ginners may buy seed cotton from natives:

$$\frac{L.P. + S.P. - D.P. - T.C.}{40} = N.P.$$

L.P. is the Liverpool price of American Middling expressed in penny points.
S.P. is the Liverpool estimated staple premium expressed in penny points.
D.P. is the dealer's profit.
T.C. is the total cost of handling from buyer to the oversea market.
N.P. is the price paid to the native expressed in shilling cents per pound of seed cotton.

has been made. In many cotton-growing districts the seed is burned as fuel in the gin. While this practice may seem expensive, it appears justified when the cost of transporting coal or oil is considered.

Exports are principally to India (Bombay), Japan, and the United Kingdom. During the early development of the industry, the United Kingdom took the major portion of the crop, but in recent years Japan and India have been important outlets. East African cotton, because of its staple length, is used in India for the manufacturing of high-count yarns. It replaces imports of raw cotton from the United States and Egypt, as well as imports of yarns of English manufacture.

UGANDA: Prices received by growers in cents per pound, for seed cotton, seasons 1928-29 to 1935-36

Season	Province				Average all Uganda a/
	Buganda	Eastern	Northern	Western	
	Cents	Cents	Cents	Cents	Cents
1928-29	b/	b/	b/	b/	4.37
1929-30	3.55	b/	b/	b/	3.66
1930-31	2.79	b/	b/	b/	2.44
1931-32	1.82	1.95	1.78	1.00	1.88
1932-33	1.94	1.85	1.62	1.54	1.86
1933-34	2.85	2.42	2.10	2.12	2.55
1934-35	2.87	3.03	2.55	2.52	2.87
1935-36	2.44	2.38	2.04	2.22	2.36

Compiled from the official records of the Uganda Department of Agriculture, Entebbe, Uganda.
a/ Weighted average price. b/ Not available.

Government Cotton Policy

The three East African Governments are definitely committed to a program of encouraging the production of cotton and other crops that can be sold on a world market and thus pay an export tax. The export tax on cotton for a number of years has been an increasing item in Government revenue. License fees and various transport and handling charges on cotton also are sources of considerable income. The maintenance of the cotton acreage and the problems pertaining to the industry, therefore, are of special official concern. In Uganda, the income from cotton, either direct or indirect, forms the largest single revenue item. Throughout British East Africa, cotton is regarded as a leading factor in developing trade and commerce, since the increased interest in a cash crop has enabled the natives to acquire more European manufactured goods.

The experiment station facilities for the developing of varieties better adapted to local conditions, the study of insects and diseases, and other technical work connected with production have not kept pace with the increasing importance of the crop. In Kenya, little or no experimental work has been done on cotton breeding, though some attention is being given

to insect and disease control. The Government of Kenya is now considering a proposal to develop cotton experiment stations. Some effort also has been made in Tanganyika to select higher-yielding varieties. The expenditures for cotton experimental work in both Kenya and Tanganyika, however, are exceeded by the budgets for the work in sisal, coffee, and other crops.

The three East African Governments, in cooperation with Zanzibar, maintain an experiment station known as the East African Agricultural Research Station, at Amani, Tanganyika. This station, established during the German occupation, is not located in the cotton territory and does no work directly associated with cotton, although some of its work on insects, diseases, and soil problems are of general interest to the cotton-growing districts.

In addition to the money spent on the encouragement of the cotton industry by the various Governments, a considerable amount of capital has been invested in gins by British organizations interested in the promotion of cotton growing. These organizations also supplement the budget of the agricultural departments of the Governments. The funds, however, are not always limited to cotton experimental work. In areas where sleeping sickness has been stamped out, the people are resettled on the land by the Government. Some of the funds of these cotton-promotion associations have been used for this purpose, the theory being that the people who are resettled will take up the production of cotton.

The aims of the Government with respect to cotton production are carried out by officials designated as agricultural officers located in the various districts. These officers work in close cooperation with a district commissioner, who is in fact an administrative officer with duties corresponding to those of a governor. Under the agricultural officers are a number of native agricultural workers, some of whom have received a certain degree of training in the agriculture of the district in which they work.

The native officers oversee the distribution of cotton seed, check the plots planted, and with the local chief of the village supervise cultivating and harvesting of the cotton crop. The whole system of production is directly under Government supervision. The area is divided into small units and each native agricultural worker is held responsible by his superior officer for the crop in a particular district. The chiefs are also held responsible for the area of their tribes. The chief in turn holds the sub-chiefs to account for the smaller or village areas. The Governments decide upon the amount of planting seed required for the season, making requisition on the ginner, who is required to supply it free, and arrange for its distribution.

In some areas where cotton growing is new, it is customary for private cotton ginners to pay the salaries of a number of native agricultural workers who work under the supervision of the agricultural officer of the district. It has been found that without the supervision of the native agricultural workers the cotton acreage in the newer areas fluctuates sharply from year to year. The Governments are not willing to allow the

natives to exercise full judgment as to the area to be cultivated or the time the crop is to be planted and harvested. These matters are determined by the agricultural officers and passed down through the native agricultural workers to the growers. The whole system is operated much like a big plantation: The Government is the owner; the agricultural workers are the overseers; and the natives are the croppers.

Outlook

The future of cotton production in East Africa, while dependent to some degree upon world conditions, will be influenced largely by local factors. The existence of a large unused area suitable for cotton growing favors an expansion of acreage. A large portion of East Africa is too high or too dry for cotton, but there are a number of areas where the elevation is low enough and climatic conditions are favorable for cotton growing. The potential labor supply is sufficient to indicate that a part of these areas can be brought under cultivation. Thousands of natives who are now engaged in growing only food crops may in the future be induced to plant cotton. The transportation system, while expensive, is sufficient to handle a reasonable increase in cotton shipments. A ready market for East African cotton abroad has contributed to the past increases and will no doubt continue to be an important factor.

The control of the local market by the Government has left the impression in the mind of the native that his interests are protected and that the price received is the best price obtainable. The absence of other cash crops in the area where cotton is grown is favorable to a greater expansion in cotton acreage. Increasing demand on the part of the native for manufactured commodities which must be imported also suggests that cotton acreage will increase. The variety of cotton now grown is reasonably well suited to soil and climatic conditions, and there is the possibility of developing a higher-yielding variety. The fact that East African cotton sells for a staple premium tends to give it an advantage in the matter of price.

The policy of the Governments regarding the cotton industry is a strong factor indicating a further expansion. With a large percentage of the revenue of the country depending upon the income from cotton, it is reasonable to expect that official effort will be made to maintain or increase the present area.

Offsetting the considerations pointing to an increased cotton acreage are a number of factors that may tend to retard the progress of the industry. Chief among these are transportation costs and losses from insects and disease. While the cost of growing cotton, from the standpoint of the native, is small, the total cost of ginning and inland and overseas transportation represents a considerable portion of the export price. These costs, some of which may fluctuate from year to year, on the whole probably will not be reduced much below present levels.

Losses resulting from insects and plant diseases are heavy; consequently, yields are generally low. In a tropical country such as East

Africa, there is little doubt that insects will become more numerous as cotton acreage increases. Cotton is a comparatively new crop. In the oldest districts of Uganda it is scarcely more than 30 years since cotton production was started. In many districts of Kenya and Tanganyika, it has become established only in recent years. With climatic conditions as they are, it is reasonable to expect that the native farmer, if faced with increased losses from insects, will be greatly handicapped. Erosion also presents a serious problem.

The system of farming small plots with hand tools limits the amount of land that the native can cultivate. At present, he handles about an acre of cotton in addition to the area required for food. While general education is spreading, many of the people in the cotton-growing districts are still primitive in their outlook. They continue to live under their tribal governments headed by chiefs and sub-chiefs. Many of them care very little for the things that may be purchased from the trader. They prefer to live as they have always lived, raising their own food and occasionally selling a cow for cash to purchase the few necessities of their tribal existence.

Taking all factors into consideration, however, it would seem that the three countries of East Africa may be expected to increase their annual cotton acreage. The farmers may count on official encouragement for a considerable period, or at least until a larger revenue from other sources is forthcoming. It might even be possible to double the present production, but only after years of education and training of the natives and the general use of power tools. It is not likely that the future development will be more rapid than the past. East Africa may in the future produce as much as 500,000 bales annually. It may eventually produce 1,000,000 bales.

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